Simple electrical motor for elementary school future teachers through scientific work e-rubric

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Abstract. This study aims to reveal on how to teach the concept of electrical motor for college students majoring in elementary education using scientific work e-rubric. The method used in this study is descriptive. The results show that the concept of electrical motor can be taught through simple media and its assessment can be carried out through an application namely e-rubric.

1. Introduction

Electrical motor is a device changing electrical energy into mechanical energy [1]. This is such an important concept that it needs to be taught since elementary education. By doing so, elementary school students will understand the basic concepts of renewable convention for energy resources in the society [2].

Electrical motor is actually a science concept commonly taught in secondary schools. However, the importance of the concept demands it to be started to be exposed since elementary education due to the fact that it occurs in humans' daily life [3].

There have been a series of evidence that concepts taught in secondary schools were also applicable to be taught in elementary schools. Some of them are the concept of electrical energy [4,5], the concept of nanotechnology [6], the concept of magnetic field [7], and so on. As a matter of fact, there are a few studies proving that the concept of electrical motor is applicable in elementary schools.

To assess students' work while making electrical motor, there needs to be a supporting application. This study offers an android-based e-rubric application [8-10]. This application enables students' grades and feedback from the teachers to be easily accessible. Therefore, this study aims at revealing on how to teach the concept of electrical motor for college students majoring in elementary teacher education using an e-rubric application.

2. Methods

The method used in this study is descriptive [6]. Students class A of elementary school teacher education major taking science subject at Universitas Kanjuruhan Malang, Indonesia, were selected as participants of this study. The assessment was conducted using scientific work indicators [10]. To collect the data, this study uses such instruments as rubric, observation sheet, and interview. To analyze the collected data, this study employs such qualitative data analysis [11] as a) data collection; b) data reduction; c) data presentation; and d) conclusion.

3. Results and discussion

In this study, students were requested to create simple electrical motor using simple material. Some of them are 3-mm and 5-mm wire, magnet, batteries, and tapes. Some simple tools such as a scissor and a cutter were also used. In the meantime, here are some of the steps in making simple electrical motor.

- Cut a 3-mm as long as 30 cm. Shape the cut wire as Figure 1 shows. Make two to three loops out of it then cut two 5-mm wires into 10 cm each and shape it as Figure 2 shows.

Figure 1. Shape 3-mm wire.

Figure 2. Shape 5-mm wire.

- Peel of every edge of the wire using a cutter until the colour changes.
- Shape the battery and the magnet into a round shape as shown by Figure 3 then tape them.

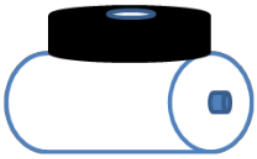

Figure 3. Shape battery and magnet.

- Arrange everything as Figure 4 shows and tape them.

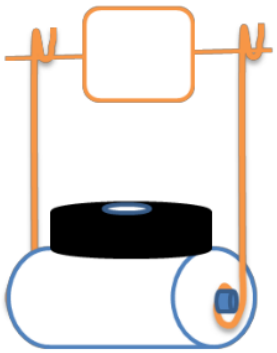

Figure 4. Simple electrical motor.

The simple electrical motor will rotate since the basic principles of it are the same with those of other types of motor as follows:

- The power on the magnetic field will produce energy
- If the wire is shaped into a loop, both of the loop's edges (on the right side of the magnetic field), will receive energy from the opposite direction.
- The energy will then produce torque to rotate the coil.
- Motor having loops on the dynamo which produce more homogeneous torqueing force and the magnetic field is produced by the electromagnetic force namely field coil.

Students' work on making the simple electrical motor was evaluated using e-rubric as described in Figure 5.

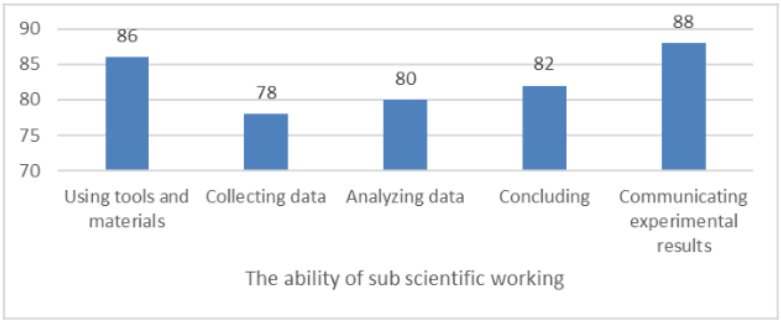

Figure 5. Scientific work was evaluated using e-rubric.

Based on the data, it has been proven that students are great in developing the scientific work. This might be due to the fact that they got used to it in the previous science subjects they took before. In addition, it has also been evident that e-rubric helped teachers evaluate. This indicates that proper instruments are able to increase the effectiveness of scientific work in learning [12].

The results also reveal that project-based learning, such as making electrical motor, should be implemented starting from elementary education [13,14]. This is to internalize their knowledge and connect their theoretical framework into real life situations [15].

4. Conclusion

This study concluded that science subject matters taught in secondary schools can actually be taught in elementary schools with simplification. Thus, project-based learning is applicable in elementary education. Regarding the evaluation, one of the proposed ways is by using e-rubric to assess scientific work. This has been proven to be effective for lecturers in evaluating students' work.

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